# Chapter 4
# Quality Assurance

## Sample Chain of Custody

During the study, sample chain-of-custody procedures were an integral part of both the sampling and analytical activities and were followed for all samples collected for laboratory analysis. The final custody procedures documented each sample from the time of its collection until its receipt by the analytical laboratory. Internal laboratory records then documented the custody of the sample through its final disposition.

Standard sample chain-of-custody procedures were used. Each sample was labeled with a unique project identification number that was recorded on a sample data sheet along with other information such as sampling date, location of the sample, size of the sample (volume or area), sampling flow rate, sampling start/stop time, and conditions (environmental and operational) of sampling.

## Sample Analysis

Specific quality assurance procedures were followed including those pertaining to the analysis of field blank samples, laboratory method blanks, laboratory control samples, and replicate sample analysis.

### *Field Blank Samples*

A field blank sample is a non-exposed sample of the medium being used for testing (e.g., mixed cellulose ester membrane filter) that is analyzed for lead as an assessment of potential lead contamination resulting from field collection and sample transport activities. The field blanks were limited to the air samples. The field blank samples for the air samples were collected by removing the colored plugs from both the top and bottom sides of the cassette for approximately 15 to 30 seconds and then replacing the plugs. The seven field blank samples did not show detectable levels of lead at a detection limit of 0.2 µg/sample.

### *Laboratory Control Samples*

Laboratory control samples (i.e., matrix spiked with known concentration of lead) were analyzed for each sample matrix (e.g., paint chip, wood chip, brick substrate, mixed cellulose ester filter, etc.). Each laboratory control sample (LCS) consisted of each matrix spiked with a certified reference material. The LCS spiking material references and the corresponding matrix were: paint chips - NIST Standard Reference

Material 2589, air sampling filters - Fisher Scientific Lot # 973670-24, TCLP extracts - High Purity Standards Lot # 726120, and soil - Environmental Resource Associates Inorganic Trace Metals Lot # 235. The laboratory control samples were analyzed with each sample set processed to verify that the accuracy and bias of the analytical process were within control limits.

The analytical data generated with the laboratory control samples fall within the specified laboratory control limits; hence, were generated while the laboratory was in control. Table 5 presents a summary of the laboratory control sample results. Appendix A contains the individual laboratory control sample results and the corresponding control charts.

***Replicate Sample Analysis***

Replicate sample analyses were performed on the field samples to determine the precision of the analytical method on each matrix (e.g., abrasive media debris, wood, brick, paint, etc.). A replicate analysis was defined in this study as a second analysis of the digestate. The precision of the analysis was estimated by the relative percent difference (RPD). The acceptance criteria for replicate analysis was <20 percent.[14, 15] All replicate analyses of the samples were <20 percent. Table 5 presents a summary of the replicate sample analysis results.

***Method Blanks***

A method blank sample was analyzed with each batch of samples to document any contamination resulting from the analytical process. The acceptance criteria were that the concentration of lead in the method blank should not be higher than the method detection limit. All method blanks showed non-detectable concentrations of lead. Table 5 presents a summary of the method blank sample results.

**Table 5. Summary of Laboratory QA/QC Analyses by Sample Set and Matrix**

| Date | Sample Set ID | Matrix | Method Blank | Laboratory Control Samples (LCS) | | | Replicate Sample Analysis | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | % Recovery | | | µg/sample or ppm | | Replicate RPD |
| | | | | LCS 1 | LCS 2 | LCS RPD[a] | Replicate 1 | Replicate 2 | |
| 4/29/98 | 98-S-2526 | MCE Filter | ND[b] | 98 | 99 | 1.2 | 98 | 98 | 0.0 |
| 4/29/98 | 98-S-2526 | MCE Filter | ND | 101 | 101 | 0.0 | 35 | 35 | 0.0 |
| 4/29/98 | 98-S-2526 | MCE Filter | - | - | - | - | 10 | 10 | 0.0 |
| 5/1/98 | 98-S-2528 | TCLP Extract | ND | 90 | 97 | 7.9 | 3.7 | 3.8 | 2.7 |
| 5/1/98 | 98-S-2528 | TCLP Extract | - | - | - | - | 32 | 30 | 6.5 |
| 4/29/98 | 98-S-2530 | Wood Chip | ND | 97 | 98 | 0.3 | 3000 | 3100 | 3.3 |
| 4/29/98 | 98-S-2530 | Wood Chip | ND | 101 | 100 | 1.2 | 970 | 960 | 1.0 |
| 4/29/98 | 98-S-2530 | Wood Chip | - | - | - | - | 5200 | 5100 | 1.9 |
| 4/30/98 | 98-S-2432 | Paint Chip | ND | 102 | 102 | 0.2 | 200000 | 190000 | 5.1 |
| 4/30/98 | 98-S-2432 | Paint Chip | - | - | - | - | 400000 | 400000 | 0.0 |
| 5/7/98 | 98-S-2746 | Wood Chip | ND | 100 | 102 | 2.3 | 1500 | 1500 | 0.0 |
| 5/7/98 | 98-S-2746 | Wood Chip | - | - | - | - | 43 | 41 | 4.8 |
| 6/11/98 | 98-S-3452 | MCE Filter | ND | 104 | 105 | 1.0 | 0.3 | <0.2 | NA[c] |
| 6/11/98 | 98-S-3452 | MCE Filter | | | | | | | |

(continued)

**Table 5 (continued)**

| Date | Sample Set ID | Matrix | Method Blank | Laboratory Control Samples (LCS) | | | Replicate Sample Analysis | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | % Recovery | | | µg/sample or ppm | | Replicate RPD |
| | | | | LCS 1 | LCS 2 | LCS RPD[a] | Replicate 1 | Replicate 2 | |
| 6/12/98 | 98-S-3453 | Paint Chip | ND | 97 | 98 | 0.5 | 3500 | 3500 | 0.0 |
| 6/22/98 | 98-S-3454 | Brick Chip | ND | 103 | 103 | 0.2 | 30 | 30 | 0/0 |
| 6/22/98 | 98-S-3454 | Brick Chip | ND | 96 | 95 | 0.1 | 150 | 150 | 0.0 |
| 6/22/98 | 98-S-3454 | Brick Chip | - | - | - | - | 46 | 46 | 0.0 |
| 6/18/98 | 98-S-3455 | MCE Filter | ND | 101 | 101 | 0.0 | 13 | 13 | 0.0 |
| 6/18/98 | 98-S-3455 | MCE Filter | ND | 101 | 98 | 3.4 | 5.1 | 5.1 | 0.0 |
| 6/18/98 | 98-S-3455 | MCE Filter | ND | 100 | 100 | 0.3 | 68 | 69 | 1.5 |
| 6/18/98 | 98-S-3455 | MCE Filter | - | - | - | - | 160 | 160 | 0.0 |
| 7/8/98 | 98-S-3457 | TCLP Extract | ND | 96 | 109 | 13.1 | 2 | 2 | 0.0 |
| 7/8/98 | 98-S-3457 | TCLP Extract | - | - | - | | 76 | 75 | 1.3 |
| 7/2/98 | 98-S-3802 | TCLP Extract | ND | 91 | 90 | 1.0 | 21 | 21 | 0.0 |
| 7/2/98 | 98-S-3802 | TCLP Extract | ND | 88 | 88 | 1.2 | 1.7 | 1.7 | 0.0 |
| 7/2/98 | 98-S-3802 | TCLP Extract | - | - | - | - | 7 | 7 | 0.0 |

[a] Denotes relative percent difference.
[b] Denotes none detected.
[c] Denotes not applicable. Both samples should contain concentrations of analyte above the detection limit.